

REMARKS

This paper is responsive to the Office Action mailed September 8, 2006 ("Office Action"). Applicant has amended Claim 19 to correct an inadvertent typographical error. Applicant respectfully traverses the rejections of Claims 1-48 for at least the reasons discussed below.

The independent claims are patentable

Independent Claims 1 and 20 stand rejected as allegedly anticipated by U.S. Patent No. 6,239,407 to Thommes ("Thommes"). In rejecting these claims, the Office Action alleges that Thommes teaches "a DC link (figure 4, item DC-link)," "first and second capacitor (figure 1, item C3 and C7 column 5, line 15-20)" and "a recharge (sic) circuit (column 5, line 5-20)." Office Action, p. 3. Respectfully, the components of the welding power supply described in Thommes and cited by the Office Action do not correspond to items in Claims 1 and 20 as alleged in the Office Action.

In particular, the "DC link" shown in Fig. 4 of Thommes does not comprise "a reference bus." Applicant notes that the apparatus described in Thommes is designed to generate an AC input into a primary winding of an isolating output transformer T3, and, therefore, the node between capacitors C3 and C7 floats, i.e., this is not a "reference bus." Accordingly, Thommes also does not disclose or suggest "a first capacitance between the first DC bus and the reference bus" and "a second capacitance between the second DC bus and the reference bus."

Furthermore, Thommes does not disclose or suggest "a precharge circuit coupled to the DC link and operative to charge a first capacitance between the first DC bus and the reference bus and to transfer charge from the charged first capacitance to a second capacitance between the second DC bus and the reference bus."

Thommes states:

After the voltage level has been properly determined by closing the proper contacts controller 104 causes contacts 115 to be closed, thus providing power to input rectifier 101. Input rectifier 101 includes a precharge circuit to prevent a resonant overcharge from harming capacitors C3 and C7 and to avoid excessively loading of the input source. A signal received by input rectifier 101 from a tap on transformer T3 turns on an SCR (described in more detail

below). The conducting SCR bypasses input current around the precharge resistors.

Thommes, column 5, lines 13-22. A preferred embodiment of the rectifier 101 is illustrated in FIG. 2 of Thommes, which illustrates a "pair of 50 ohm resistors R1 and R2 that are provided to precharge capacitors C4, C3 and C7 (shown in FIG. 1) upon start up." This circuitry appears to charge the capacitors C3 and C7 simultaneously, rather than in the manner recited in Claims 1 and 20.

Accordingly, Applicant submits that Thommes does not disclose or suggest several of the recitations of independent Claims 1 and 20. For at least these reasons, Applicant submits that independent Claims 1 and 20 are patentable over Thommes.

Independent Claims 19 and 20 stand rejected as being allegedly obvious over a combination of Thommes, U.S. Patent No. 6,239,407 to Johnson, Jr. ("Johnson") and U.S. Patent No. 6,222,352 to Lenk ("Lenk"). Office Action, p. 3. The Office Action states that Thommes discloses the claimed subject matter "except the utilization of the technique for a balancer circuit, and inductor, a buck converter," that Johnson teaches "utilization of a similar technique for a balancer circuit (figure 2)," and that Lenk teaches "the utilization of the technique for an inductor and buck converter (figure 1 and Abstract)." Office Action, p. 3. The Office Action alleges that the motivation for modifying Thommes according to Johnson and Lenk is "providing a mechanism for controlling voltage excursions on intermediate DC busses." Office Action, p. 4.

The asserted combination of Thommes, Lenk and Johnson does not teach or suggest all of the recitations of Claim 19, and the Office Action fails to provide the requisite evidence from the prior art of a motivation to combine these references to produce the recitations of Claim 19. In particular, there is nothing in the cited material that teaches how a buck converter as described in Lenk would be combined with the welding power source circuitry described in Thommes, for example, how the buck converter of Lenk would be used in conjunction with the rectifier 101, boost circuit 102 and PWM 103 shown in Fig. 1 of Thommes. Moreover, the Office Action provides no clear and particular evidence from the prior art that teaches or suggests the advantages of such a modification of Thommes, as the stated motivation, i.e., "providing a mechanism for controlling voltage excursions on intermediate DC busses" pertains to the balancer circuit as described in Johnson (Johnson, column 2,

lines 34-47) and therefore, is not relevant to the buck converter shown in Lenk. With respect to Johnson, Applicant further notes that Claim 19 does not recite a "balancer circuit" and therefore, Johnson does not appear to be pertinent to Claim 19.

Accordingly, Applicant submits that Thommes, Lenk and Johnson, alone or in combination, do not teach or suggest Claim 19 and, for at least these reasons, Applicant submits that Claim 19 is patentable over the cited combination of Thommes, Johnson and Lenk.

This combination of references also does not teach or suggest the recitations of Claim 20. Claim 20 recites:

A power conversion apparatus, comprising:
a DC link comprising first and second DC busses and a reference bus;
a boost converter circuit coupled to the DC link and operative to generate first and second DC voltages with respect to the reference bus on respective ones of the first and second DC busses from an AC source and/or a DC source; and
a precharge circuit coupled to the DC link and operative to charge a first capacitance between the first DC bus and the reference bus and to transfer charge from the charged first capacitance to a second capacitance between the second DC bus and the reference bus.

Along the lines discussed above with respect to the anticipation rejections of Claims 1 and 20, Thommes does not disclose or suggest the recited DC link, capacitances and precharge circuit as recited Claim 20. In addition, there is no recitation of a "buck converter" or a "balancer circuit" in Claim 20, so the cited Lenk and Johnson references appear to be irrelevant to Claim 20, and do not supply the teachings missing from Thommes. Accordingly, the cited combination of Thommes, Johnson and Lenk does not disclose or suggest the recitations of Claim 20 and, for at least this reason, Claim 20 is patentable over the combination of Thommes, Johnson and Lenk.

Independent Claim 25 stands rejected based on a combination of Thommes and U.S. Patent No. 5,519,306 to Itoh et al. ("Itoh"). Office Action, p. 4. The Office Action alleges that Thommes teaches all of the recitations of Claim 25 "except the utilization of the technique for uninterruptible power supply (UPS), and AC and/or DC source." Office Action, p. 4. The Office Action alleges Itoh provides these missing teachings, stating that "[i]t would have been obvious . . . to modify

Thommes' power supply by utilizing the technique taught by Itoh et al. for the purpose of improving power factor of the power supply." Office Action, p. 4.

Applicant submits that Thommes does not provide the teachings alleged with respect to Claim 25 for at least similar reasons to those discussed above with reference to the rejections of Claims 1 and 20. Furthermore, Applicant notes that Thommes describes a welding power supply, and "improving power factor" provides no motivation for turning the welding power supply described in Thommes into a UPS as described in Itoh. Accordingly, the cited combination does not disclose or suggest the recitations of independent Claim 25, and there is no evidence of a motivation or suggestion to combine Thommes and Itoh to produce the recitations of independent Claim 25. For at least these reasons, Applicant submits that independent Claim 25 is patentable over the cited combination of Thommes and Itoh.

The exact basis for the rejection of independent Claim 40 is unclear, as the Office Action merely refers to "the apparatus" and states "the previous rejections based on the apparatus will not be repeated." Office Action, pp. 4 and 5. Applicant assumes this implies that Claim 40 stands rejected as anticipated by Thommes. Applicant submits that Claim 40 is patentable over Thommes for at least similar reasons to those discussed above in support of the patentability of Claims 1 and 20 over Thommes.

The dependent claims are patentable

Applicant submits that dependent Claims 2-18, 21-24, 26-39 and 40-48 are patentable at least by virtue of the patentability of the respective ones of independent Claims 1, 20, 25 and 40 from which they depend. Applicant further submits that several of the dependent claims are separately patentable.

For example, Claim 3, which stands rejected as allegedly obvious based on a the combination of Thommes, Lenk and Johnson, recites:

An apparatus according to Claim 1, wherein the precharge circuit comprises:
a precharge converter circuit operative to charge the first capacitance from an AC source and/or a DC source; and
a balancer circuit operative to transfer charge between the first and second capacitances.

The combination of Thommes, Lenk and Johnson does not disclose or suggest such recitations. In particular, while Johnson describes a balancer circuit, Johnson does not disclose or suggest a precharge circuit including such a balancer circuit, or the recited charge transfer from a first capacitance that is charged by a precharge converter circuit. Lenk appears to be irrelevant to the subject matter of Claim 3. Accordingly, the cited combination does not disclose or suggest the recitations of Claim 3 and, for at least these reasons, Applicant submits that Claim 3 is separately patentable. At least similar reasons support the separate patentability of Claim 22.

Claim 9, which also stands rejected as allegedly obvious based on the combination of Thommes, Johnson and Lenk, recites:

An apparatus according to Claim 1, wherein the precharge circuit is operative to charge the first capacitance to increase a voltage between the first DC bus and the reference bus to a first voltage and to initiate charge transfer to the second capacitance after the voltage between the first DC bus and the reference bus reaches the first voltage.

The Office Action fails to provide any indication as to where such recitations are taught in the cited references, and Applicant submits that the references, taken alone or in combination, simply do not disclose or suggest such recitations.

Claim 10, which stands rejected based on the combination of Thommes, Johnson and Lenk, recites "wherein the precharge circuit is further operative to terminate charge transfer to the second capacitance after a voltage between the second DC bus and the reference bus reaches a second voltage." As with Claim 9, the Office Action fails to provide any specific indication as to where the cited references allegedly teach such recitations. Applicant submits that the references are devoid of any such teachings, and for at least these reasons, Applicant submits that Claim 10 is separately patentable.

Claim 12, which stands rejected as obvious based on Thommes, Johnson and Lenk, recites "wherein the precharge circuit is further operative to initiate charge transfer from the charged second capacitance to the first capacitance to further boost the voltage between the first DC bus and the reference bus." As with the rejections of Claims 9 and 10, the Office Action is silent as to where these recitations are allegedly taught or suggested. Applicant submits that such teachings are not present in the cited references, alone or in combination. For at least these reasons, Applicant submits that Claim 12 is separately patentable.

Claim 14 recites:

An apparatus according to Claim 9, wherein the precharge circuit comprises:
a buck converter circuit operative to charge the first capacitance from an AC power source and/or a DC power source;
a balancer circuit operative to transfer charge between the first and second capacitances; and
a control circuit coupled to the buck converter circuit and to the balancer circuit, the control circuit operative to cause the buck converter circuit to charge the first capacitance to increase the voltage between the first DC bus and the reference bus to the first voltage and to cause the balancer circuit to transfer charge from the charged first capacitance to the second capacitance after the voltage between the first DC bus and the reference voltage reaches the first voltage.

As noted above, the Office Action provides insufficient evidence that a combination of Thommes, Johnson and Lenk produces such recitations. For example, there is no teaching as to how or why the buck converter in Lenk would be combined with the circuitry shown in Thommes and Johnson. For at least these reasons, Applicant submits that Claim 14 is separately patentable.

Claim 27, which stands rejected as obvious based on the combination of Thommes and Itoh, recites:

A UPS according to Claim 25, wherein the precharge circuit comprises:
a precharge converter circuit operative to charge the first capacitance from an AC source and/or a DC source; and
a balancer circuit operative to transfer charge between the first and second capacitances.

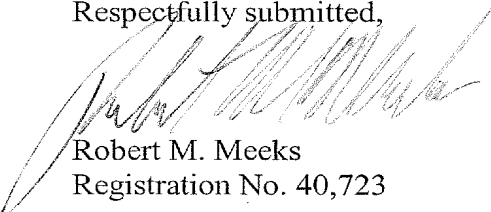
The Office Action provides no specific indication as to how the cited combination teaches such recitations, as the rejections of Claims 25-36 are supported by a single paragraph that cites Thommes as applied to Claims 1-24, and only vaguely refers to Itoh as teaching "the similar technique for UPS and an AC/DC source (column 3, line 30-45)." Office Action, p. 4. This material includes no mention of anything resembling a balancer circuit. Accordingly, the cited combination does not disclose or suggest the recitations of Claim 26 and, for at least these reasons, Applicant submits that Claim 26 is separately patentable.

Similar reasons support the separate patentability of several of Claims 27-39, as the Office Action fails to address several of the specific recitations of these claims. Applicant, therefore, submits that the rejections of these claims are also improper and should be withdrawn.

Conclusion

As all of the claims are in condition for allowance, Applicant respectfully requests allowance of the claims and passing of the application to issue in due course. Applicant urges the Examiner to contact Applicant's undersigned representative at (919) 854-1400 to resolve any remaining formal issues.

Respectfully submitted,



Robert M. Meeks
Registration No. 40,723

Customer Number 20792
Myers Bigel Sibley & Sajovec, P.A.
P.O. Box 37428
Raleigh, NC 27627
919-854-1400
919-854-1401 (Fax)

CERTIFICATION OF ELECTRONIC TRANSMISSION

I hereby certify that this correspondence is being transmitted electronically to the U.S. Patent and Trademark Office on December 7, 2006.



Candi L. Riggs